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Turbulence-driven ion beams in the magnetospheric Kelvin-Helmholtz instability

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The description of the local turbulent energy transfer via a heuristic proxy derived from the third-order moment scaling law, and the high-resolution ion distributions measured by the Magnetospheric Multiscale mission, together provide a formidable tool to explore the cross-scale connection between the fluid-scale energy cascade and plasma processes at sub-ion scales. Using magnetospheric boundary layers measurements, we show that when the small-scale energy transfer is dominated by Alfvénic, correlated velocity and magnetic field fluctuations, beams of accelerated particles are more likely observed. Here, for the first time we report observations suggesting the nonlinear wave-particle interaction as one possible mechanism for the energy dissipation in space plasmas.